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The law of worthy life is fundamentally the law of strife. It is only thru labor and painful effort, by grim energy and resolute courage, that we move on to better things.—Theodore Roosevelt.

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American Electro-Platers' Society

Editors' Office, 236 Wellington Ave., S. E., Grand Rapids, Mich.

VOL. IX MARCH No. 3

EDITORIAL

MEMBERSHIP

The American Electro-Platers' Society is reaching a very creditable position with regard to the question of membership. We lack but fifty-five of having one thousand members, probably an approximate one-half of the men that are fully eligible and desirable are on our membership list at this time; the rest of them would be if the present members would present to their non-member friends, the particular and peculiar benefits secured by becoming members. We should at least increase the membership to one thousand during the ensuing two months; one thousand members! It is an easy mark to shoot!

It will take but little work to reach that. Our twenty-four Branches would only have to average a fraction over two members each. Some of the Branch Societies have almost exhausted their territory, but some of them have a very large number of prospects if they only make a determined drive for them.

Cleveland's is a good example. They have added more members to their list during the past two months than in a whole year previous. Taking into consideration the number of members on their books January first and the number on March first, the percentage of increase is higher than any other Branch has made in the whole year. Some other Branches have shown good increases, but a few others could do even better than Cleveland has done.

This is a matter for Branch officers to consider and act upon. Get busy in April, bring the matter up at the April meeting, and don't stop there: Appoint committees to make a strong, quick drive for new members. Turn in the names to the Supreme Secretary at once, even if a special late April meeting has to be called at the home of some member to pass on applications. In other words: OFFICERS, GET BUSY!

Another matter of unusual importance. The coming Convention is to be the most important for several years. The committee for the revision of the Constitution is to report a new draft of that instrument; it will need a very strong Supreme Society to give it proper consideration and to pass it.

Many of the Branch Societies will nominate officers and delegates or appoint nominating committees at the April meetings. All will have to elect in May. It is the hope and expectation of the Executive Committee that every Branch will send at least one of their best members as delegate to the Cincinnati Convention; we hope that most of the Branches will be represened by the three that they are entitled to as representatives in the Supreme Society.

Send men of opinion, men that can take the floor and express that opinion, too; it is not promising too much to say that President Uhl will recognize each and every such man that may desire to be heard, or to express an opinion, on any of the extraordinarily important matters before the Cincinnati Convention.

MODERN THEORIES OF ELECTROLYTIC SOLUTIONS

By W. R. Veazey

A Scotch preacher, meeting one of his parishioners after the morning service, asked him how he liked the sermon. The old Scotchman, with characteristic frankness, replied: 'I did not like it.' "Why not?" asked the preacher. "Well, in the first place you read it; in the second place you did not read it well; and in the third place, it was not worth reading."

We fear that in presenting the following paper, we may lay ourselves open to all of the Scotchman's criticism since we are entirely unfamiliar with the viewpoint and mental attitude of the practical electro-plater toward this subject.

It is our purpose to present only two of the modern theories of electrolytic solutions in a very dogmatic way, without any attempt whatever to give the proofs or arguments for the validity of these conceptions.

Our main object is to interest you in the theoretical aspects of the work, with which you are already so familiar from a practical standpoint. It is our hope that new points of view may appear which will aid in solving some of the many vexatious problems which always arise whenever electrolytic operations are carried out.

We shall not attempt to tell you in any sense about the practical side of your art, since that would without doubt be another attempt to "Carry Coals to New Castle."

We have assumed, however, that the pressure of daily business has left but little time or opportunity to most of you, in which to make an extended study of the theoretical subjects connected with the art of electroplating, and we have, therefore, endeavored to make our presentation as simple as we are able. If, in so doing, we make our discussion too elementary, less harm will ensue than if we should be guilty of boring you with too much abstruse theory.

Let us first consider the basis or excuse for any kind of a scientific theory. If we study the history of any art, we find that men first discovered things by accident, and then as necessity demanded, put these things to practical use. For many years this is the only kind of progress that can be noted. Progress is always very slow when chance observation and lucky experience are the only sources of new facts and ideas.

When men began asking the questions, "Why are these things true?" "Why do certain results always follow a given set of circumstances?"—science had its real beginnings.

"The object of any science is to make the most complete possible presentation of natural phenomena in such a way that the knowledge of them can be gained with the least possible effort." (A. A. Noyes, "Principles of Physical Science.") How can such an object be reached? The answer to this question is found in the answer to a similar one: "How shall we proceed to investigate any new problem and get results with the least possible expenditure of energy, time, and money?"

Some would say, "Seek a genius who can solve our problem." Genius is not the gift of a fair and fickle goddess who bestows her favors on a chosen few. Genius is hard work applied in a systematic manner.

The modern method of procedure is as follows:

First, all facts which seem to have a bearing on the problem in hand are collected. These facts are found by our own personal experience and from such experience as others skilled in the art have published or have otherwise made known to us.

Second, an attempt is then made to explain these facts by imagining a cause which could have produced the results we have noted. Such an imaginary cause is called a hypothesis. It is quite evident that a number of very different hypotheses will in time be proposed by various people, and if this were the end of our procedure, nothing would be gained. It is fortunate, however, that we are all inclined by nature to criticize the statements of our fellow-men and more particularly if their ideas conflict with our own.

Thus at once here comes about a sifting of hypotheses and we are all compelled to find new facts to support our pet hypothesis. These new efforts bring to light many new facts which would otherwise have remained hidden, and in the light of this new information many of the original hypotheses must be discarded. However, if some one hypothesis remains which is still in accord with all the known facts and which offers a rational explanation for them, it becomes known as a theory. Because a theory represents the collective thought of a large group of workers, it is a very valuable guide in practical work. A good theory will usually predict the outcome of any new set of circumstances, and therefore eliminates a large amount of aimless work by indicating just what experiments should be made and what ones will terminate in failure. A theory provides a definite aim and is not dependent on chance accumulation of new knowledge. A gun without sights will shoot just as hard and just as far as the same gun provided with good sights, but the number of hits on the target will be few and far between. A good theory provides the sights for

the skillful worker's artillery and prevents much useless waste of the valuable ammunition: Time, Energy, and Money.

History proves beyond all question, that the most rapid progress is made in any art only when free exchange of ideas prevails among those working in that art.

The worker along any line who secludes himself and his knowledge from his fellows becomes limited in vision and experience, and in these days of extremely rapid progress, rapidly falls behind the procession and becomes a "back number."

The art of electro-plating involves the continuous use of solutions and of the electric current. What is the nature of a solution? What is the nature of the electric current? This latter question has for a long time been a very difficult one, but the modern electron theory of matter has afforded a partial answer. We shall not attempt to discuss this subject further at this time, as it would lead us far afield and detract rather than add to our main object.

The nature of a solution is much more completely understood. There are three general classes of solution, which for convenience we will call: non-electrolytic solutions, electrolytic solutions, and pseudo, or false solutions. What is a solution? How do the three classes of solutions differ from each other? Why do some solutions conduct electricity while others do not?

A solution is a uniform mixture of two or more substances which has the same physical and chemical properties thruout all of its parts. In so far as ordinary plating baths are concerned, one of these substances is always water, which acts as the solvent for the various other substances which are added to the plating bath. We shall confine our further statements to solutions of things in water.

All substances in their ultimate nature consist of extremely small particles called molecules. These molecules in turn are made up of combinations of small particles of elementary substances. These particles of elements are called atoms. An elementary substance or an element is a substance which up to the present time has not been broken down into any simpler substances. About 87 such elements are known at present. Some familiar examples from the list are: Copper, Nickel, Lead, Zinc, Iron, Sulphur, Hydrogen and Oxygen.

A solution which does not conduct the electric current is simply a uniform mixture of molecules of water with molecules of the things dissolved in the water. Such a solution can be made by dissolving sugar in water.

A solution which does conduct the electric current is very different in nature. It does not consist simply of molecules of water mixed with molecules of the various salts. When an acid, or alkali, or salt is dissolved in water, the molecules of these substances act on each other in such a way, that the molecules of the acid, alkali or salt are broken up into atoms or groups of atoms, which are charged with electricity, some with positive electricity and others with negative electricity. Those atoms or groups of atoms which are charged with positive electricity are called cations (because they are attracted to the cathode when the solution is electrolized.)

Those atoms or groups of atoms, which are charged with negative electricity are called anions (because they are attracted to the anode during electrolysis).

Some of the molecules of water are also broken up into ions of hydrogen and of oxygen, so that in addition to other ions from salts, bases or acids, there are always hydrogen and oxygen ions present in any plating-bath.

The total number of cations and the total number of anions in any solution may be the same or these numbers may be different, dependent on the nature of the salt dissolved, but in any case the total amount of positive electricity on the cations in the solution is always exactly equal to the total amount of negative electricity on the anions in the solution.

Since the cations and anions are uniformly distributed thruout the solution, it is electrically neutral in all its parts. This theory of the nature of electrolytic solutions is called the ionization theory, or the Electrolytic Dissociation Theory, or Arrhenius Theory of Solution.

If this theory were merely useful or a guide in electrochemical work, it would be well worth a large amount of study, but it is doubly important in that it offers a satisfactory explanation of many facts outside the realm of electrochemistry.

In the light of this theory any solution that conducts electricity consists of almost countless numbers of positively and negatively charged particles uniformly mixed with molecules of water, and when a pair of charged electrodes are placed in such a solution, all the positively charged particles in the solution will begin to move toward the negative electrode, and all the negatively charged ones toward the positive electrode. Those particles which are already at the electrode of opposite sign cannot move toward the electrode but will simply discharge to it and thus it is evident that electrolysis will take

place the instant the electromotive force is applied to the electrodes.

This at once leads us to the question of "How does an electric current get thru a solution?" It is evident that the action at the electrode surfaces differs from the action thruout the interior of the solution.

Let us follow the current as it enters the solution, at the anode, passes thru the solution and emerged from it at the cathode, and see how in the light of our theory each of these processes is accomplished. In other words, "what is the mechanism of electrolysis?"

There are four different ways in which the passage of the positive electricity into the solution may be accomplished:

(1) The atoms of the electrode itself may take on positive charges of electricity from the source of current and thus become cations which dissolve in the solution carrying the positive electricity into the solution with them. This is the way in which a copper anode, for example, dissolved in a plating-bath.

(2) Instead of the electrode material itself dissolving into the solution, there may be a simple passage of positive electricity from the electrode surface to a positive ion already in the solution, thus giving the positive ion more positive charge than it originally had. In this case the electrode is inert and does not change, but the ion in solution changes in its properties and is said to have been oxidized.

For example, ferrous sulphate or green vitriol may be oxidized around an anode, and if the solution is not too acid, red oxide of iron will be precipitated around or on the anode. Since the passage of negative electricity in one direction is exactly equivalent electrically to the passage of an equal amount of positive electricity in the opposite direction. Two other ways exist for the passage of electricity into the solution from an anode. Instead of the anode itself dissolving in the form of positive ions, the oxygen ions, which are negative ions, may give up their charges to the anode and thus neutralize positive electricity on the anode. This is exactly equivelent electrically to positive electricity going into the solution. In this case oxygen gas is evolved at the anode and the anode does not dissolve. The last way consists in a negative ion giving up only a part of its negative electricity to the anode, but remaining in solution as a negative ion of a different sort. In such a case apparently electricity has passed from electrode to solution without causing any chemical action, but such is not the case, as the ion which lost part of its negative electricity is now dif-

ferent chemically. It has been oxidized. This oxidizing action of an anode is used in many electro-chemical manufacturing processes, such as, for example, the manufacture of chlorate of potash from chloride of potash.

It is quite evident that from a theoretical standpoint, at least, all of these types of action may take place at once, and if so, the result is disastrous, if only one of them is desired. By careful study of conditions it is possible to determine just what conditions favor each of these processes, and when they occur, to know just what conditions to alter so as to bring about the particular one of these processes that may be desired and exclude the others. This is a most important study, but we cannot follow it further at this time.

In a similar but exactly opposition fashion electricity may pass from a solution to the cathode in four different ways:

(1) By discharge of positively charged ions from the solution to the electrode. For example, the plating out of copper or hydrogen.

(2) By a positive ion giving up only part of its charge to the electrode, but remaining in solution in a reduced form. No deposit of any kind takes place on the electrode.

(3) By solution of the cathode itself in the form of negative ions which pass into solution. This process never occurs with metallic electrodes, and is a special case which will never be met in electro-plating processes. It, however, is quite common in other electro-chemical processes.

(4) By passage of negative electricity from the cathode to a negative ion already in solution, thus producing a reduced form of the ion without any visible change at the electrode.

Here again simultaneous occurence of two or more of these processes may be fatal to the work in hand, and a knowledge of their control is of utmost importance.

The mechanism of the passage of the current thru the interior of the solution is quite simple. It consists of an endless stream of positive ions away from the anode toward the cathode, and at the same time a similar stream of negative ions in the opposite direction. The sum of the positive and negative electricity carried by the ions through a given part of the solution is just equal in amount to the total quantity of electricity passing thru the outside metallic circuit.

It is of interest here to note that in view of this theory it is evident that while the total current at the junction of anode with solution may be composed of positive ions passing into solution (as when a copper anode dissolved) and that the total current at the junction of cathode and solution may be com-

posed of positive ions plating out on the electrode (as when copper deposits), yet never is the whole current thru the interior of the solution composed of positive ions alone, moving thru the solution, but always consists of positive and negative ions moving in opposite directions, and this must mean that more ions go into solution from the anode than travel thru the solution, with the result that the copper solution grows more concentrated around the anode and at the same time more copper plates out at the cathode than travels thru the solution, so that the copper solution grows more dilute around the cathode, hence, in order to maintain uniform plating conditions, it is necessary to stir or circulate the electrolyte continuously during electrolysis.

At this point it is well for us to note that the ions of metals and of hydrogen are always positively charged, whereas the ions of non-metallic substances constitute the negative ions of a solution.

We may be asking ourselves, "Why is it that when several metals are in solution together, say, copper, iron and zinc, that they do not all plate out together?" "Why is it possible to plate out only one of these metals at a time to the entire exclusion of the others?"

This leads us to a consideration of a second theory of fundamental importance in electro-chemical processes, which is called, "The Electrolytic Solution Tension Theory," as proposed by the physical chemist Nernst.

A simple statement of this theory is that, "When any metal is placed in contact with water, some of that metal passes into solution in the form of positively charged ions." Let us consider the consequences of this theory and see how it accords with known facts.

The force which causes this solution of metal in water is called the "Solution Tension" of the metal.

When positively charged metal ions pass into solution, a corresponding amount of negative electricity is left on the metal bar. But positively and negatively charged substances attract each other, hence the positive ions are not free to float around in the water, but are held as a closely adhering layer very near the surface of the metal bar. Thus we have established a condition of a negative bar of metal coated on the outside with a layer of positive ions of the metal. This is known as a "Helmholtz Double Layer."

Every metal has a different Solution Tension. Hence the degree to which the above action takes place is directly dependent on the magnitude of the Solution Tension of any

metal. The voltage or potential difference beween the metal and the ion layer in every Helmholtz Double Layer depends then on the solution tension of the metal in question. This voltage or potential difference is called Electro-static Attraction and in the case mentioned acts to oppose the Solution Tension and bring the system to a condition of equilibrium.

If two different metals are placed in the same solution, each will be at a different potential or voltage with respect to its respective surrounding layer of ions. Since these ion layers are in the solution, each metal will have a different potential against the solution. If now the metals be connected with each other by wire, a flow of electricity will take place in such a way as to bring them both to the same potential.

This is accomplished by a flow of negative electricity from the more negative metal to the less negative metal. But such a flow destroys the equilibrium of both the Helmholtz Layers, and the Solution Tension again acts as before. The net result of the complete process is the solution of the metal of higher Solution Tension and the plating out of the metal of lower Solution Tension, or in some cases of hydrogen in its stead. Thus from this simple theory the whole field of galvanic action is opened up and we find that if our study is followed out in detail, we obtain a full and complete explanation of the action of all kinds of primary and secondary batteries and of the corrosion and plating of metals. Not only is this explanation a qualitative one which makes clear the mechanism of the processes involved, but from it the quantitative results that will be obtained from any given set of metals and solutions and conditions can be calculated.

In view of this theory it is evident that in order to plate a metal out of a solution, the electric current must be applied in such a way that its voltage will be opposed to the solution tension of the metal being plated out, and since each metal has a different solution tension, the application of a certain voltage will plate out metals whose solution tension are less than the applied voltage, but other metals which may be present will not deposit.

Lest we should leave an entirely wrong impression with you, let us again say that while we have endeavored to adhere strictly to the sense of modern theory in outlining the various topics we have mentioned, yet no attempt whatever has been made to follow out any of these subjects completely. We have endeavored merely to make the artist's rough outline sketch which must be filled in by many hours of painstaking labor if the completed picture is to be viewed.

SPOTTING-OUT

By George B. Hogaboom

At the Indianapolis Convention, the writer stated that, in his opinion, "spotting-out" is more of a metallurgical trouble than an electro-plating one. It would be necessary, if "spotting-out" is to be eliminated, to go back of the plating solution to the structure of the metal. It is believed, that metal with coarse crystalline structure, or a metal that had been poured at a higher temperature than was necessary, would, when electro-plated, "spot-out." If a casting, free from all oxides, with a fine crystalline structure, such as could be obtained by using a good de-oxidizing agent while the metal is in a molten state, and the pouring temperature of the metal is proper, "spotting-out", to a large extent, will be eliminated. This term should not be confused with the condition which properly should be designated as "spotting-in," as it is believed that there are just as many cases of "spotting-in" as there are "spotting-out."

It is interesting to note, in an article published recently, an excerpt of which is given below, that a writer, not directly connected with electro-plating, has found that a casting with a coarse crystalline structure did absorb an acid solution. A casting of the same (coarse) structure would naturally absorb acid after being pickled or bright dipped. If electro-plated, the solution would be absorbed. While nickel deposits may not show "spotting-out", due to the nickel not being readily affected by dilute nickel solutions, cyanide would be absorbed from a cyanide solution, and it would dissolve the metal, or bring about an electrolytic action, and cause a discoloration which would be termed "spotting-out."

Below is the excerpt of the article mentioned:

"A good example of the penetration and absorption of an acid solution, in a coarse-grained metal, and the care which must be exercised to eliminate any salts or adherent acid before weighing, is a sample of an acid-resisting metal immersed in a concentrated solution of sulphuric acid for 500 hours. When the test was complete, the sample was removed from the solution, carefully washed in the usual manner in distilled water and weighed. The loss in corrosion was 1,460 per cent. However, within 24 hours after this weighing, the dry sample showed a slight incrustation of sulphates on the surface. The sample was then placed in a beaker of distilled water where it remained for 24 hours, to remove any remaining acid or salt formation. The water, at the end of this time, was distinctly acid, and then the sample was again dried and weighed, the loss from the original weight was 2.003 per cent, and

the difference from the first weight after the test was 0.543 per cent. This instance demonstrated the great care which must be exercised to obtain a clean sample after tests are made. It also demonstrated the fact that this particular piece contained exceedingly open or coarse structure at the center, or perhaps some segregation."*

It is believed that the character of the metal of this structure will materially influence the character of the deposit. You would expect a much different deposit upon a porous or spongy article than you would upon one with a dense structure. While, in the case of such castings mentioned, the structure would probably have to be examined under a microscope, to determine the size of the crystals, it is true that it is porous and would affect the nature, or the character of the metal deposit upon it. This has been found so in a large number of cases.

In buffing operations, it has been found that coarse crystalline structures do not reflect light as well as metal which has a fine crystalline structure. This would naturally be expected. Coarse woods cannot be polished to as high a finish as fine-grained hard woods; neither can coarse metals be polished to as high a lustre as fine-grained or fine crystalline structured metal. In the case of wood, it requires a filler before a high finish can be obtained. With metals, it is impossible to put a filler on, unless, as is often done in cast iron or steel, a heavy deposit of acid copper is put on the base metal, and then polished down to a surface—the copper acts as a filler. In other metals, it is not practical to do this and consequently when a coarse-grained metal, e.g. brass, has been colored, the lustre is not high, and when e.g. nickel is deposited a high lustre cannot be had upon the nickel-plate. The same thing is true of silver. In the case of silver, however, the burnishing tool breaks down coarse crystalline structures and makes a close-grained coating which will receive a high lustre.

This subject is not thoroughly understood, and there is not enough data available to make definite statements or to produce definite proof, but enough preliminary work has been done to indicate that the statements made are correct. There may be exceptions, but it is believed that these exceptions will be found to be rare. It is difficult to carry in the eye a color

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* Excerpt from article entitled, "Seeks Better Acid-Resisting Alloys," by George A. Drysdale (Paper presented before the Indianapolis Section of the American Society of Mechanical Engineers, October 28, 1921), published in "The Foundry," for December 15, 1921.

or a lustre, and it will be necessary to have metals of different crystalline structure that have been finished under the identical conditions, alongside of one another before any definite data can be had.

The above excerpt would tend to prove that the arguments offered are correct, and that before the "spotting-out" trouble, and many of the coarse metal deposits, can be eliminated, it will be necessary to have the metal properly heat-treated, which will require the making and subsequent working to be controlled by a metallurgist. The plater is no metallurgist, but he is asked to cover up many defects that the metallurgist can correct.

ANSWERS TO MANY QUESTIONS

By THEODORE C. EICHSTAEDT

New York Wants to Know (December "Review")

Question No. 1: Does a lead brightener in a copper solution have a detrimental effect upon work to be oxidized?

The writer's experience has been that it does, and should not be used in a copper solution at any time, as there is a certain amount of lead deposited, and this prevents ordinary oxidization solutions, such as are ordinarily employed in copper oxidizing, from oxidizing.

The writer has found that for a brightener for a copper solution the regular arsenic and caustic potash solution, made up as a stock solution, can be used to good advantage if used cautiously and sparingly. And this will not interfere with oxidizing in an ordinary lime of sulphur or polly sulphide oxidizing solution.

Question No. 2: Regarding overcoming spotting out of brass-plated steel and other metals.

The writer cannot help but smile at this question, as it is one that we always have asked, and many solutions have been advanced. Some years ago, when he did not have nearly as much experience as now, he went into this subject very extensively thru one of our trade journals, and had quite a lot of publicity from it and heard from many platers and chemists, especially from College Professors, and even from some in England, and I thought that was a settled question. But not so, as we may only look back to our last Convention in Indianapolis, when we had fully a two- or three-hour discussion on this "everlasting question of spotting out". One of our Past Presidents, and now a very well-informed man, and who has devoted some years in research work, Mr. George Hogaboom, gave us a very interesting talk then on this question, and said among other things that it may sometimes be a "spotting in," or it may be in the metal to be plated, and cannot be overcome in such cases.

But the writer will give a remedy that is simple but not al-

ways effective, all depending upon conditions on steel or gray iron or brass stamping. It will generally work providing the base metal or article to be plated is not too porous.

The article, of course, must be thoroly cleansed and well rinsed and then given about five minutes in a nickel solution; then given from 20 minutes to half an hour in a real good brass solution; then taken out of brass solution. It should be rinsed in cold water, then hot water, and rinsed in cold water, then hot water again, then hung in a dilute muriatic acid solution for from 20 minutes to half an hour, this acid solution to be of not more than 5° Baumé test, and then rinsed in cold and hot water twice. If the plated articles are to be scratch brushed a little muriatic acid can be added to the water to keep it from staining.

Mr. C. S. Thompson also has a paper written on the subject, which was published in the November REVIEW.

Question No. 3: The best way to remove scale from springs without breaking?

This all depends upon the size, shape and weight of the springs in question. It is the experience of the writer that if the springs are of such size that they can be tumbled, that it is the best way to remove the scale by tumbling with either sand or emery or other abrasive material, or if they cannot be tumbled then they should be sand-blasted. Spring washers the same. He has also observed very fine coil springs cleaned in this way, that they are also plated in a barrel plating machine and that some of the abrasive gets lodged into the springs, spreading the same and thereby allows a deposit on the inside of the spring, where it was almost impossible to get a deposit before. Pickling makes the springs break sometimes long after they are plated, and in use therefore no good.

Question No. 5, Chicago Branch, in the November "Review."

Question No. 5: What is the best way to make a rapid nickel solution?

Answer No. 5: Combined double and single nickel salts, boracic acid and salt.

The writer in his experience has handled many so-called rapid nickel solutions and wishes to state that he also has come in contact with many he has had nothing to do with the handling of during his travels thruout the country, and wishes to state that in his opinion there is no better formula for a rapid nickel solution, that at the same time is practically self-sustaining, than the one published in "Longbeins," edition of 1920, by the writer, herewith given, but in order to get the exact data of its working, he refers you to that book ("Longbeins," 1920), a book which every progressive plater should have in his possession.

Formula for 10 gallons of water:

1 lb. Double Nickel Salts; 7½ lbs. Single Nickel Salts; ½ lb. Mag. Sulphate (Epsom Salts); 1 lb. Boracic Acid. A 96% to 98% N. Anode should be used. This solution will be free from sludge, and agitation can be employed without stirring up any sediment, as there will be none.

WHAT THE BRANCHES ARE DOING

Chicago

The regular meeting for February was held Feb. 11th. We were visited by one of our members from away, Mr. Frank O'Denz.

Three applications were received.

Under the head of the good and welfare of the Branch, it was suggested that we take up the subjects of Polishing, Efficiency and Production in addition to the regular plating topics discussed at our already good meetings.

The March meeting, held on March 11th, was attended by an unusually large crowd. A St. Louis member, Mr. Frank Rushton, was present. We were glad to welcome him.

An invitation was received to attend the Milwaukee Banquet en masse.

A committee was appointed to secure a number of interesting papers for the Convention at Cincinnati. President Burt appointed the following: Mr. E. Lamoreaux, O. E. Servis and Vice-President W. G. Bott. These stars will mean some real convention boosting on the part of the Chicago Branch.

CHICAGO QUESTION-BOX FOR FEBRUARY

QUESTION NO. 1—What is a good lubricant for burnishing Aluminum in ball-burnishing barrel, one that will not tarnish aluminum?

ANSWER NO. 1—Whale-oil soap was best known lubricant, and you must use a lot of it or the work becomes cloudy.

QUESTION NO. 2—What is the reason for nickel-plate turning a blue color after being subjected to 30-min, heat test; the object is an electric iron?

ANSWER NO. 2—It was suggested that it could come from either one of two causes. One was that solution contained a large percentage of iron and it deposited out on the article being plated, and under heat pressure it became oxidized. Other cause suggested was that the construction of the iron was faulty and that the face plate covering the element was too thin and not of sufficient thickness to stand the heat, causing nickeled part to become too hot and blue color to appear.

QUESTION NO. 3—Would like a bright strip for 19k gold; also 18k green gold?

ANSWER NO. 3—It was thought that any gold strip made with cyanide, using current making work the anode and using a cathode about 20 times the size of the object to be stripped would be alright, but care should be exercised, as work with solder joints is easily spoiled, the joints being attacked very readily.

QUESTION NO. 4—What causes new nickel solution to plate rough the second day (slightly acid)?

ANSWER NO. 4—It was thought that impurities and dirt getting into materials used in making new solution could have caused this con-

dition, or that old anodes in a new solution improperly cleaned would do it, or new anodes not cleaned and a high current pressure used might dissolve minute particles from the surface of anodes and deposit upon the work. It was suggested to bright dip anodes and place upon cathode rod and run for a couple of hours. Electrolyze the solution to overcome the trouble.

QUESTION NO. 5—What is best container to hold silver solution while moving the same from one shop to another?

ANSWER NO. 5—It was thought, after discussion, that the acid carboy was the best container to use.

QUESTION NO. 6—Has anyone present ever used Gum Tragamuth to make a nickel solution bright, and if so, what were the results?

ANSWER NO. 6—No one present ever used this for a brightener in a nickel solution, and one member said he understood that this was part of a patented process.

QUESTION NO. 7—Which is the better compound to use for a brightener in cyanide copper solution, sodium bisulphite or sodium hyposulphite? Also, can these be used in a brass solution?

ANSWER NO. 7—Hyposulphite of sodium is a good brightener for copper, and bi-sulphite can be used in brass.

QUESTION NO. 8—What causes anodes to coat over in a copper sulphate solution; the solution contains 1½ ozs. aluminum sulphate to the gallon, and sulphuric acids was added after making up solution?

ANSWER NO. 8—It was thought that this caused by solution being too dense and could be overcome by lowering the specific gravity of the solution by adding water. The question of anodes came up and it was thought that a cast anode coated more readily than a rolled anode, but as the member did not state the kind of anode, the cause could not be further determined.

QUESTION NO. 9—What test can be used for determining the amount of copper in a silver solution?

ANSWER NO. 9—Precipitate silver and copper with an acid such as sulphuric acid; the precipitation will be silver cyanide; wash precipitate, then dissolve precipitate in nitric acid; then precipitate silver with sodium chloride. The copper is left in the solution. Neutralize copper-bearing solution with excess of aqua ammonia; titrate the copper with 1/10 normal cyanide solution.

QUESTION NO. 10—What is the cause of brass-plated articles done in plating-barrel discoloring during rinsing and drying? Is there any chemical I can put in rinse-water to prevent this. Samples of work submitted.

ANSWER NO. 10—It was decided after discussion that the parts did not have sufficient deposit and the member was advised to richen up his solution in metals. It was stated that he could use cream of tartar in his rinse-water, but this was expensive and not necessary if solution was richened up.

QUESTION NO. 11—Can ⅞ No. 7 Sheradized wood screws be nickel-plated bright in a mechanical plater? That is, the screws have

been sheradized, being rough and dull. Must be brightened in ball burnisher or otherwise, but cannot be tumbled too long for fear of injury to the sheradizing. Then a bright nickel upon the sheradizing?

ANSWER NO. 11—It was suggested to tumble in sawdust and brighten a little; then to immerse only in a hot copper and caustic soda dip until insulated coat is on the screws; then run a mechanical plater containing a bright nickel solution.

CHICAGO QUESTION-BOX FOR MARCH

QUESTION NO. 1—Would like some information on agate ball burnishing and where agate balls can be obtained.

ANSWER NO. 1—It was stated that agate balls had been tried with no success; also African pebbles. One member suggested to use common glass marbles, but no one present thought that burnishing with agate balls would be commercially successful.

QUESTION NO. 2—Please give formula for green brass in mechanical plating barrel, and hints for operating the same.

ANSWER NO. 2—It was suggested that the brass solution in question should contain an excess of sal soda and be low in cyanide and a little more copper than the regular formula, but the member stated that the color, while it could be obtained, was hard to regulate and operate commercially, and suggested to plate and tint the lacquer the desired color.

QUESTION NO. 3—What is the best method to strip silver off old brittannia ware, one that will not attack the base metal too readily?

ANSWER NO. 3—There were three or four methods given, and each one good, so I am including them all. The first was to use concentrated solution of sulphuric acid and saltpetre and use hot and keep water out, or use muriatic acid in place of sulphuric acid, about 2 oz. to the gallon. Second, use the regular cyanide strip, 8 oz. to the gallon, and reverse current. Third, Sodium nitrate, 6 oz. to the gallon, and reverse current. Fourth, use 1 gallon of sulphuric acid, ½ pint of water, small amount of glycerine, reverse current, and after stripping immerse in a strong cyanide dip to remove the smut.

QUESTION NO. 4—What process is used besides the copper bronze metalizing wood?

ANSWER NO. 4—It was thought that the best process was copper powder made for this purpose, free from oils and fats, and the wood should be properly dryed to prevent checking or shrinking away from the deposit, and should be dipped in boiling wax to seal the pores and create a good surface for the primary deposit. Then dip in a silver solution containing very little free cyanide, and then into the acid copper bath for deposit.

QUESTION NO. 5—Can a mechanical plating machine be used with a black nickel. If so, give particulars.

ANSWER NO. 5—It was suggested to the member to see the 1921 issues of "Metal Industry," for Mr. Haas' formulas upon this subject, the one containing Rochelle Salts, or write the Bureau of Standards, Washington, D. C., for their paper No. 190, and this will give their results on Black Nickel Research Work.

GRAND RAPIDS

The regular monthly meeting of the Grand Rapids Branch was held at the Vocational High School, March 8th, President Whalley presiding.

The main topic of conversation was the banquet, to be held on Saturday, April 15th, at the Elks' Temple. We are planning on this being the best ever. A fine program has been arranged, including several speakers and several good papers on plating will be read. The banquet will be in the form of a stag; the Committee is making a drive to get as many manufacturers to attend as possible.

The meeting closed with a discussion on finishes.

NEW YORK

The regular meetings of New York Branch were held on Feb. 10 and Feb. 24 at the Broadway Central Hotel. President J. A. Stremel presided.

The main topics under discussion were as follows:

QUESTION NO. 1—What is a good method or formula for burnishing die cast articles in a barrel?

ANSWER NO. 1—Tumble in a saturated solution of zinc sulphate.

QUESTION NO. 2—Can sherradized wood screws be barrel burnished and plated?

ANSWER NO. 2—Yes; tumble in soap, bark and water; then cyanide copper plate.

QUESTION NO. 3—What is a good basket to use in a hot sulphuric acid dip?

ANSWER NO. 3—Steel wire mesh basket, providing water is not allowed to get into the dip. Nichrome baskets are the best, but in this case steel is the cheapest as no water is being used,

Black nickel was subjected to a lengthy discussion during part of the evening.

CLEVELAND

About the only items of interest that I can send you at this writing is a little report on our first banquet, which we held at The Hotel Winton, on February 25th. Altho the attendance was not what we had anticipated, still we seated sixty-five members and friends at the festive board. Mr. Ter Doest, the founder of the Branch, gave the opening address of welcome, and Mr. Sliter, one of the early pioneers in the A. E. S. ranks, gave a brief history of the Society. Dr. W. R. Veasey of the Case School of Applied Science, assistant professor of chemistry in that institution, read a carefully prepared paper on "Modern Theories of Electrolytic Solutions," which was given very close attention. Mr. Erman followed Dr. Veasey, and gave a monologue stunt that was good. The vocal efforts of Messrs. McIntyre and Ramerman received many encores.

We had the ladies with us to help matters along, so between visit-

ing and dancing everybody put in a most enjoyable evening. Not the least item of interest was that several non-members who were present asked for application blanks.

As our banquet was held on our February meeting night, our meeting for that month was postponed till March 25th.

ST. LOUIS

We had a good attendance at our regular meeting on March 4th. One application for membership was received. A vote of thanks was extended to "The Metal Industry" for the 1921 bound volume given to our Branch Library.

The discussion on "Nickel Anodes," led by J. H. Jordan and Chas. Fischer, brought out a variety of ideas as to advisability of cleaning them and as to how often and the best manner of doing same.

The shapes and per cent of nickel contents of new anodes were discussed as well as using up small butts, etc., sometimes called scrap.

TORONTO

The regular meeting was presided over by President Wm. H. Cresswell. The Entertainment Committee submitted their report of the "Social" held January 31, which was well received, and the Committee was given a vote of thanks.

The Social was opened by the Chairman, Past-President W. S. Barrows, with an address on the aims and objects of the Society, which was followed by the reading of papers on "Nickel-Plating," by Mr. F. H. Thiers; "Copper-Plating," by J. A. Magill; "Silver-Plating," by Thos. O'Keefe and Wm. H. Cresswell; "Gold-Plating," by Chas. Kemish and James Vallier; "Brass-Plating," by E. Coles; "Efficiency in the Plating-room," by J. Acheson (when it comes to efficiency John is always there).

All papers were voted good, and with discussions, took up the whole evening, after which we all repaired to the room where refreshments were laid out for us, and there was more than enough to go around, and even at that the Committee showed a surplus from receipts which will be used for similar purposes. It proved such a success that a committee was appointed at our regular meeting of February to proceed to hold a demonstration or exhibition of work, which no doubt will be well worth seeing.

MILWAUKEE

Lost, Strayed or Stolen!

Johnny Gutman—Popular vice-president of the Milwaukee Branch has disappeared. When last seen he was wearing his usual smile and heading for the East. As he did not tell the boys where he was going, his friends have become alarmed, especially Bob, the secretary, as he does not know whether Johnny is getting his "REVIEWS" and notices.

MILWAUKEE QUESTION-BOX

QUESTION NO. 1—What are the functions of arsenic in a brass solution?

ANSWER NO. 1—It has a tendency to bring the zinc out of the solution, giving a bright clear color.

QUESTION NO. 2—What is the best anode to use in a hot cyanide copper solution?

ANSWER NO. 2—Electrolytic copper anodes.

QUESTION NO. 3—Want a formula for a good bright dip for copper.

ANSWER NO. 3—Use 3 gals. sulphuric acid, 2 gals. nitric acid, and a small amount of salt and 1 quart of water.

Or use 2 parts sulphuric acid and 1 part of nitric acid.

QUESTION NO. 4—Why does the solution in a nickel-plating barrel get hot? The work is carried on 24 hours each day in this tank; the solution gets so hot that you cannot keep your hand in the solution.

ANSWER NO. 4—Solution did not conduct well enough; after one pint of sulphuric acid was added to the solution in a 90-gallon tank, the trouble ceased.

Information Wanted!

Want a dip to brighten die castings, the same to be used in same way as a bright dip for brass or copper.

CINCINNATI

Meet us all in Cincinnati in 1922!

The regular meeting was held on February third. The attendance was good and the meeting was a very busy one. We are spending our time in preparation for the coming CONVENTION IN CINCI.

The Convention Committee is beginning to work overtime on the job, and will be very busy men until the time arrives.

The Committee at present is: Chairman F. J. Gordon, and Messrs. Thomas Buchanan, C. Vance and Frederick Brunner.

The regular meeting for March was held on Friday, March third. We had a very good attendance. Everyone is working hard for the success of the CONVENTION IN CINCI.

The plans show that there will be some very interesting and beneficial papers read, and there will be entertainment of a less serious kind in plenty.

The members who visited the Dayton Banquet report that the occasion was highly enjoyed by them all. They wish to thank the Dayton Branch for the invitation.

Meet us all in Cincinnati in 1922!

NEW MEMBERS

New York

F. J. MacStocker.....210 Edison Place, Glendale, L. I.
H. D. Holler.....Polytechnic Institute, Brooklyn, N. Y.
C. F. Heines.....2813—8th Ave., New York City, N. Y.

Indianapolis

William Grund.....1710 N. Washington St., Kokomo, Ind.
W. A. Staff.....608 W. 31st St., Indianapolis, Ind.

Chicago

Valentine J. Heubner.....311 Jefferson Ave., Aurora, Ill.
William Varnish.....4424 Lake Park Ave., Chicago, Ill.

Philadelphia

Harry C. Shelly.....Sellersville, Pa.
Philip A. Lower.....105 Powelton Ave., Woodlyne, N. J.

Waterbury

Howard Rice.....23 Fairview St., Waterbury, Conn.

APPLICATIONS FOR MEMBERSHIP

New York

William A. Leppert.....107 East 89th St., New York City, N. Y.

Cleveland

Ralph H. Frank.....11432 Dove Ave., Cleveland, Ohio
Jesse W. Groomes.....1014 Second St., Lorain, Ohio

Dayton

William A. Brandt.....315 Richard St., Dayton, Ohio
William Donly.....111 Gunckel Ave., Dayton, Ohio
George Kopf.....63 Virginia Ave., Dayton, Ohio

Philadelphia

George F. Stanton.....Baltimore, Maryland

Detroit

Guy H. Baldwin.....2309 McGraw Ave., Detroit, Mich.

St. Louis

John W. Fletcher.....210 E. 9th St., Metropolis, Ill.

Bridgeport

J. Frank Toole.....464 Chapel St., New Haven, Conn.

W. J. Allen, Editor, Cincinnati, Ohio, March 7th, 1922.
Grand Rapids, Mich.

Dear Sir:—

The time for the next Convention is approaching, and Cincinnati Branch appeals to every members of the A. E. S. for their coöperation in order to make this Convention the best ever.

In order to accomplish this end we must have educational papers read and to exhibit our work. We should like to have this Branch contribute as many papers as it possibly can, that we may arrange to have them read at some of our sessions of the Convention.

I trust you will take up this matter at your meeting and urge every member to do his best. If all will do their best, we know we will have something worth-while, and the success of the Convention will be assured.

Sincerely yours,
WM. J. HUSING.

Philadelphia, Pa., February 6th, 1922.

Mr. W. J. Allen, Editor.

Dear Sir:—

I have a letter from Dr. Blum in which he states since the meeting of the Advisory Committee of the Electro-Platers' Society was held in October, several of the members have tested out in their plants the method for testing the acidity of the Nickel Solutions which have been developed. The results so far obtained are promising.

And to further carry on the work, Mr. M. K. Thompson of the Bureau of Standards came to Philahelphia today to make experiments and tests at several of the plating plants and give the necessarry information and instructions, and furnish each of the plants with the equipments and solutions for making the tests so they can report results to the Bureau at intervals.

Dr. Blum reports everything is going well with the work, and hopes during the next few months to get information on Nickel Solutions which will be definitely applicable by the platers.

Yours truly,
PHILIP UHL, President.

Banquet --- ROCHESTER --- Banquet

We Guarantee the

"THE TIME OF YOUR LIFE"

At The Seneca Hotel, 6 P. M., April 22nd, 1922

BRING THE LADIES DANCING AFTER DINNER

Tickets, $2.50

GRAND RAPIDS BRANCH

Fourth Annual Banquet

Will be held April 15th, at 7 P. M.

A SPLENDID PROGRAM HAS BEEN ARRANGED

Place—ELKS' CLUB **Tickets, $2.00**

BRANCH DIRECTORY

BOSTON

Regular meetings are held second and fourth Thursdays of each month, at 8 p. m., at the American House, Boston. Secretary, A. W. Garrett, 37 Dorset St., Dorchester, Mass.

BRIDGEPORT

Meets third Friday of each month in its laboratory, 260 John St., Bridgeport, Conn. Secretary, L. J. Maraffi, 744 Hancock Ave., Bridgeport, Conn.

CHICAGO

Meets second Saturday of each month, at 8 p. m., at the Briggs House, Randolph and Wells Sts. Secretary, F. J. Hanlon, 2855 N. Richmond St., Chicago, Ill.

CINCINNATI

Meets on the first and third Friday of each month, at 1262 State Ave. Secretary, W. J. Husing, 729 McMakin Ave., Cincinnati, Ohio.

CLEVELAND

Meets last Saturday of each month at Hotel Winton. Secretary, B. F. McCormick, 2024 Wyandotte Ave., Lakewood, O.

CONNECTICUT VALLEY

Meets on the second Tuesday of each month at 202 Washington St., Hartford, Conn. Secretary, G. E. Vibberts, 31 Crown St., Hartford, Conn.

DAYTON

Meets first Saturday of each month at the Y. M. C. A., Dayton, Ohio. Secretary, C. Van Deran, 61 Bish Ave. Dayton, Ohio.

DETROIT

Meets first Friday of each month at the Board of Commerce, Lafayette and Sheldon, at 8 p. m. Secretary, O. H. Phelps, 951 Clay Ave., Detroit, Mich.

GRAND RAPIDS

Meets on the second Wednesday of each month at the Vocational High School, 129 Bostwick Ave., NE. Secretary, J. Andrew Warner, 738 Fairview Ave., N. E., Grand Rapids, Mich.

INDIANAPOLIS

Meets the second Saturday of each month at Hotel Denison. Secretary, Louis Mertz, 1728 Union St., Indianapolis, Ind.

MILWAUKEE

Meets second and fourth Thursdays of each month at the West Side Bank Bldg. Secretary, R. Steuernagel, 1508 Concordia Ave., Milwaukee, Wis.

MONTREAL

Secretary, A. Geroux, 48 Craig West, Montreal, Quebec, Canada.

NEWARK

Meets first, third and fifth Fridays of each month at Forresters' Home, 20 Central Ave., Newark, N. J., at 8 p. m. Secretary, O. F. Carlson, 225 West Grand St., Rahway, N. J.

NEW YORK

Meets second and fourth Fridays of each month at the Broadway Central Hotel Parlors, New York City. Secretary, E. Haas, 504 East 163rd St., New York, N. Y.

PHILADELPHIA

Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Sts. Secretary, P. Uhl, 2432 North 29th St., Philadelphia, Pa.

PITTSBURGH

Meets first Saturday of each month at 8 p. m., at United States Bureau of Mines Bldg., Forbes St. Secretary, S. E. Hedden, 227 Fifth St., Aspinwall, Pa.

PROVIDENCE-ATTLEBORO

Meets first and third Thursday of each month at 26 Custom House St., Room 16. Secretary, C. J. Poyton, 269 Ohio Ave., Providence, R. I.

READING

Meets on the second Tuesday of each month. Secretary, William M. Fisher, 654 Gordon St., Reading, Pa.

ROCHESTER

Meets every second and fourth Friday of each month, at Hotel Seneca. Secretary, E. E. Fitch, Jr., 607 Sawyer St., Rochester, N. Y.

SYRACUSE

Secretary, M. J. Crean, 109 Court St., Syracuse N. Y.

ST. LOUIS

Meets first Saturday of each month at Barr Branch Library, corner Jefferson and Lafayette Sts. Secretary, H. H. Williams, 4156 Botanical Ave., St. Louis, Mo.

TOLEDO

Meets first Thursday of each month at Toledo University Science Building, Electro-Platers' Room, corner Cherry and Page Sts. Secretary, H. L. Myers, 410 Palmer, Toledo, Ohio.

TORONTO

Meets second Thursday of each month at Occident Hall, Bathurst and Queen Sts. Secretary, C. Kemish, 271 Boston Ave., Toronto, Ontario, Canada.

WATERBURY

Meets every second and fourth Friday of each month. Secretary, Wm. Delage, 47 Prospect St., Waterbury, Conn.